IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants: Ramon R. Reglos et al.

Assignee: Xilinx, Inc.

Title: Method for Sorting Dice by Speed During Die Bond Assembly and Packaging to Customer Order

Serial No.:	09/974,552	Filing Date:	10/09/2001
Examiner:	Andre C. Stevenson	Art Unit:	2812
Docket No.:	X-887 US	Conf. No.:	7190

Mail Stop Amendment
COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450

DECLARATION UNDER 37 C.F.R. §1.131

Dear Sir:

I hereby state and declare that I, Ramon R. Reglos, am a joint inventor of the subject matter which is claimed and for which a patent is sought on the invention entitled, "Method for Sorting Dice by Speed During Die Bond Assembly and Packaging to Customer Order," having Application Serial Number 09/974,552, and filed on October 9, 2001.

I, Ramon R. Reglos, further state and declare that I have reviewed and understand the contents of the above-identified specification, including the claims, and that:

The invention claimed in the above-referenced application was conceived and reduced to practice before September 12, 2001. Attached as Exhibit A is a true and accurate copy of an invention disclosure form that was prepared and witnessed prior to September 12, 2001, and that describes the claimed invention, with the dates redacted.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Signed this ___3 1___ day of May, 2005, by:

_____
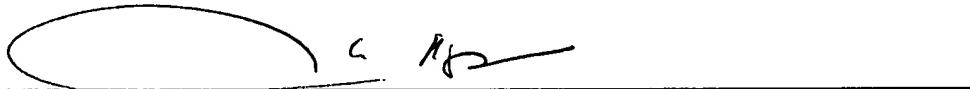
Ramon R. Reglos

Witnessed this ___3 1st___ day of May, 2005, by:

Signature: _____
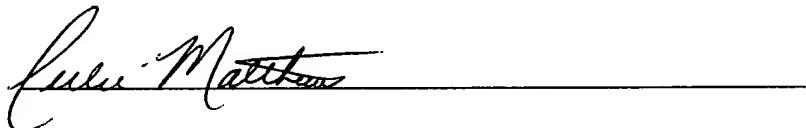
Name: ___Julie Matthews_____

EXHIBIT

A

XILINX®

Invention Disclosure
Xilinx Confidential Proprietary

Title of Invention Method of Sorting Dice by Speed during Die Bond Assembly

*Determination of inventorship is a legal question that must be made by the Intellectual Property Group. An inventor's signature **must** include full first, middle, and last name.

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*Inventor 1

Ramon Rosal Reglos
Inventor's Full Name Including Middle Name

E-mail Address

Home Address

Street: Number and Name   City

Inventor's Signature

Work Phone

Citizenship

State   ZIP Code

Location & Dept. No.

Employee Status	
X☐	Full Time
☐	Contractor
☐	Intern

Country or Province

Date

~Inventor 2

Alelie Tarayao Funcell
Inventor's Full Name Including Middle Name

E-mail Address

Home Address

Street: Number and Name   City

Inventor's Signature

Work Phone

Citizenship

State   ZIP Code

Location & Dept. No.

Employee Status	
X☐	Full
☐	Contractor
☐	Intern

Country or Province

Date

---

*Inventor 3

Inventor's Full Name Including Middle Name

E-mail Address

Home Address

Street: Number and Name   City

Inventor's Signature

Work Phone

Citizenship

State   ZIP Code

Location & Dept. No.

Employee Status	
☐	Full/Part-Time
☐	Contractor
☐	Intern

Country or Province

Date

---

*Inventor 4

Inventor's Full Name Including Middle Name

E-mail Address

Home Address

Street: Number and Name   City

Inventor's Signature

Work Phone

Citizenship

State   ZIP Code

Location & Dept. No.

Employee Status	
☐	Full/Part-Time
☐	Contractor
☐	Intern

Country or Province

Date

2

*Inventor 5

_____
Inventor's Full Name Including Middle Name

Work Phone _____

Citizenship _____

E-mail Address _____

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_____
Street: Number and Name   City

State   ZIP Code

Country or Province

_____
Inventor's Signature

Location & Dept. No.

Date

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*Inventor 6

_____
Inventor's Full Name Including Middle Name

Work Phone _____

Citizenship _____

E-mail Address _____

Home Address

_____
Street: Number and Name   City

State   ZIP Code

Country or Province

_____
Inventor's Signature

Location & Dept. No.

Date

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*Inventor 7

_____
Inventor's Full Name Including Middle Name

Work Phone _____

Citizenship _____

E-mail Address _____

Home Address

_____
Street: Number and Name   City

State   ZIP Code

Country or Province

_____
Inventor's Signature

Location & Dept. No.

Date

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*Inventor 8

_____
Inventor's Full Name Including Middle Name

Work Phone _____

Citizenship _____

E-mail Address _____

Home Address

_____
Street: Number and Name   City

State   ZIP Code

Country or Province

_____
Inventor's Signature

Location & Dept. No.

Date

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*Inventor 9

_____
Inventor's Full Name Including Middle Name

Work Phone _____

Citizenship _____

E-mail Address _____

Home Address

_____
Street: Number and Name   City

State   ZIP Code

Country or Province

_____
Inventor's Signature

Location & Dept. No.

Date

The information requested below may serve as the basis for a patent application, therefore be as complete and as accurate as possible. Please describe your invention below, and, if necessary <u>add pages and supporting drawings</u>.

1.   Abstract of the Invention — In a few sentences, briefly describe what your invention is and what it does.
To incorporate "die speed sorting" capability into multiple package types/carriers during DIE BOND
assembly process. This feature will provide the flexibility to process selective die speed within a wafer. The
die attach machine can be programmed to DIE BOND different "die speed" on one package type or die
bond different "die speed" on different package types. The die attach machine will have capability to be
programmed to Die Sort and transfer all other dice per speed grade into separate waffle packs/die carriers to
enable die-storage for future assembly builds.
- See attached diagram/flow#1

2. **Background Information** — Provide sufficient background information so that the function and novelty of your invention can be understood. What techniques prior to your invention were used to perform the function of your invention, and what are the disadvantages? What problem is solved by your invention? What are the advantages of your invention over the prior techniques?

Customer places order with specified speed grade. All good pre-sorted dice with different speed grades in the wafer are die bonded onto a single output ; one selected package. Speed grade sorting is done after package assembly, at Final Electrical Test. Parts are marked per speed grade which is an additional step. Tested units that meet customer speed grades are shipped and other units with different speed grades are stored in Finished Goods Inventory..

The disadvantages of the current process are:

1. Excessive inventories of packaged products with different speed grades.
2. Shortage of packaged products with required speed grade
3. Extra labor to add the speed grade on the package during Final test
4. Speed grade is pre-marked at assembly according to mark instructions. All units in a wafer maybe be marked as one speed grade knowing that there are different speed grade within the lot. The intent is to assemble enough units to support customer orders on time. If there are extra units from the lot after electrical, the units are stored in Finished Goods inventory. There are times when product markings are erased and re-marked for speed-down grade to meet customer shipments.

Problem solved:
1. Enables die-storage with specific-speed grade vs keeping inventory at Finished Goods. Therefore, lower inventory cost.
2. Supports Build To Order flow efficiently/effectively
3. Improved cycle time. Speed grade is pre marked in assembly, eliminate marking after electrical test
4. Products with pre-mark speed grade will be processed through Finished Goods, No Bin inventory required
5. Eliminate rework/remarking

3. **Detailed Description** — (a) Describe the structural *and* functional operation of your invention. Use drawings, graphs, or flowcharts as needed to describe your invention. Give specific details, not just general information. Point out what improvements your invention incorporates or the superior performance which is obtained and *why* it is obtained. (b) Are there any alternative methods or different structural embodiments of your invention? Can the general idea or technique of your invention be extended to other related fields? (c) Which features are believed to be the novel features (be specific)? (d) How could you prevent competitors from circumventing your invention?

A) Incorporate Die Speed Sorting at Die Bond Process and eliminate Speed Sorting at Electrical Test. See abstract of inventions item 1 above.
B) Allows Die Attaching on same package but different Bonding to multiple package types or pin counts , multiple die-waffle packs per speed grade.
C) Incorporate " Die Speed Sorting at Die Bond Process, Eliminate Speed Sorting at Electrical Test
D) Xilinx will design this equipment with a Die Attach equipment manufacturer. We will arrange agreement for proprietary use of this equipment. Eventually, similar versions may become available in the industry. Through this patent, we hope we can slow down copy-cats.

+. List **and attach** a copy of the most pertinent publications (articles, app notes, patents, patent applications, invention disclosures, etc.) to your invention that are known to you.

____Die Attach Process Patents._____

5. The witnesses should read and understand the disclosure and sign in the appropriate spaces below. The inventors and witnesses should initial and date each added page of disclosure.
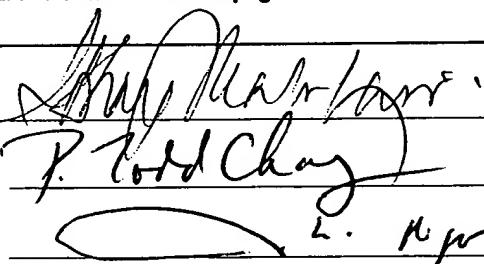
Witness _____   Date _____
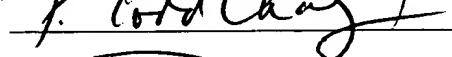
Witness _____   Date _____

Prepared By _____   Date _____

To be filled in by the ENGINEERING or MARKETING/PRODUCT MANAGER or equivalent. Use separate sheets as required. THE MANAGER(S) IN SIGNING THIS FORM ATTEST THAT THEY UNDERSTAND THE INVENTION.

What is the market for products incorporating this invention?

_____

_____

_____

Discuss the business impact that this invention will have on Xilinx. Be Specific and Quantitative.

| Engineering Manager's Name/Title (Type or Print)	Signature	Date	Dept No.	Phone
███████████	██████	████	████	████
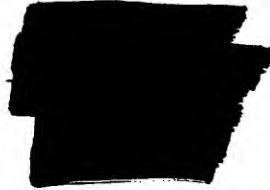
Inventions:
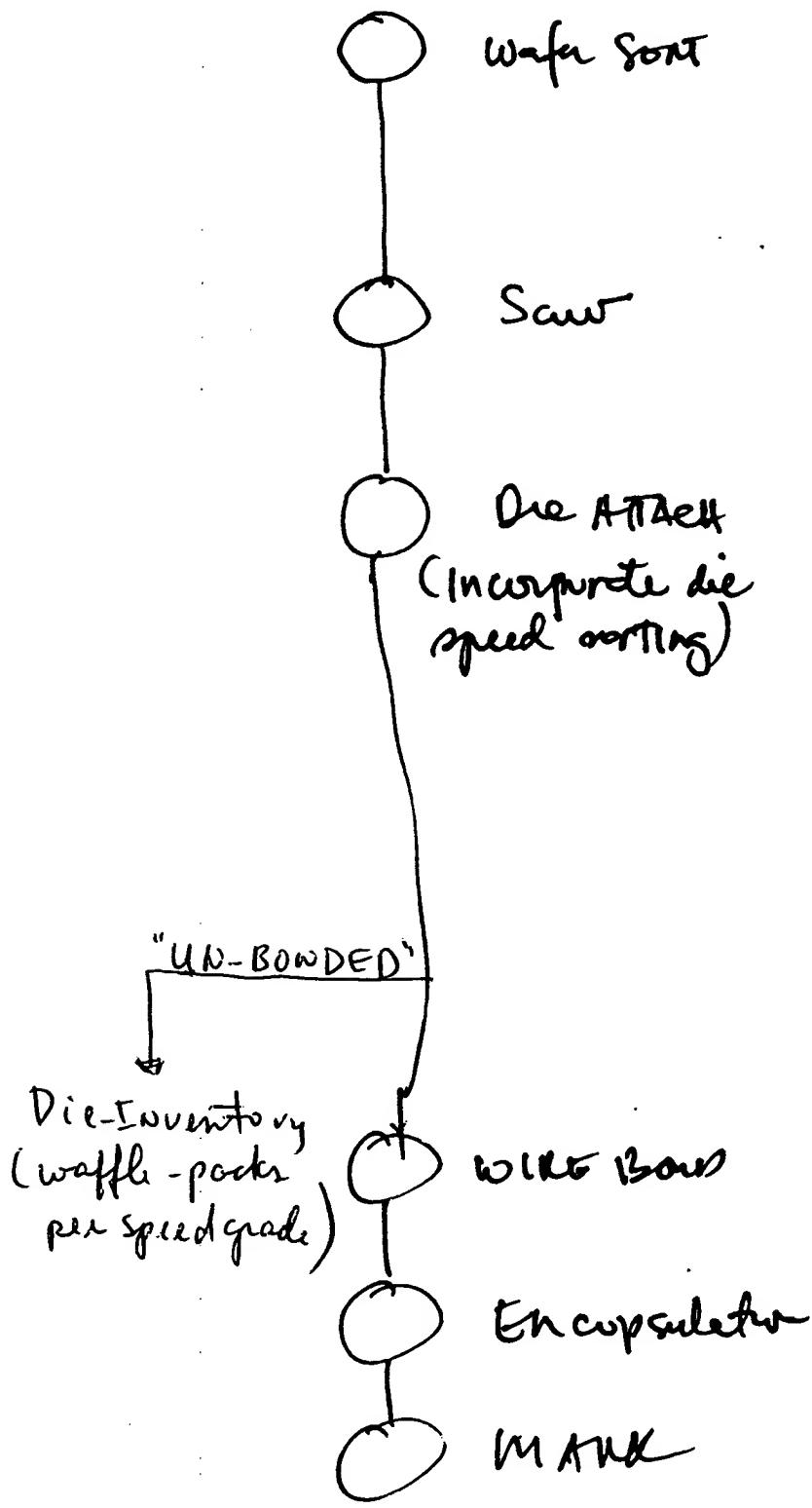
◯ Wafer Sort — good die, speed grade is stored in wafer map file

◯ Saw — Dice/cut individual die, wafer map is intact

◯ Die ATTACH
(incorporate die
speed sorting) — Using wafer map, die Bonder is programmed to identify units of different speed grades i.e,

- Pick and attach selected speed grade on one package type.
- Pick and attach different speed grades on one package type, offloaded 1 speed grade/pkg type.
- Transfer units with die of different speed grade into die carrier for future assembly builds segregated per speed grade.
- Pick and attach chosen speed grades to multiple pkg type or the same pkg type but different pin-con.

"UN-BONDED"

Die-Inventory
(waffle-packs
per speed grade)

◯ WIRE Bond

◯ Encapsulate

◯ MARK

Pg 1 of 2

R. Rechos

Electrical Test

Ship

Diagram #1

OUTPUT:

PQ 240 (STRIP2)

TRACK # 1

Track 2 are Adjustable

Die Border #1

FC 252 (STRIP2)

TRACK #2

Input: INKLESS (or INKED) wafers

BC 352 (using boats)

Track # 3

SORTED Die [CARRIER]

Track #4

Die Border #2

BC 352 [convertible/adjustable] depends

on Body size 352 = 35×35 mm, 432 = 40×40 JG0 = 42.5 × 42.5 mm

Die Carrier Speed 1

Die Carrier Speed 2

Dia am #2
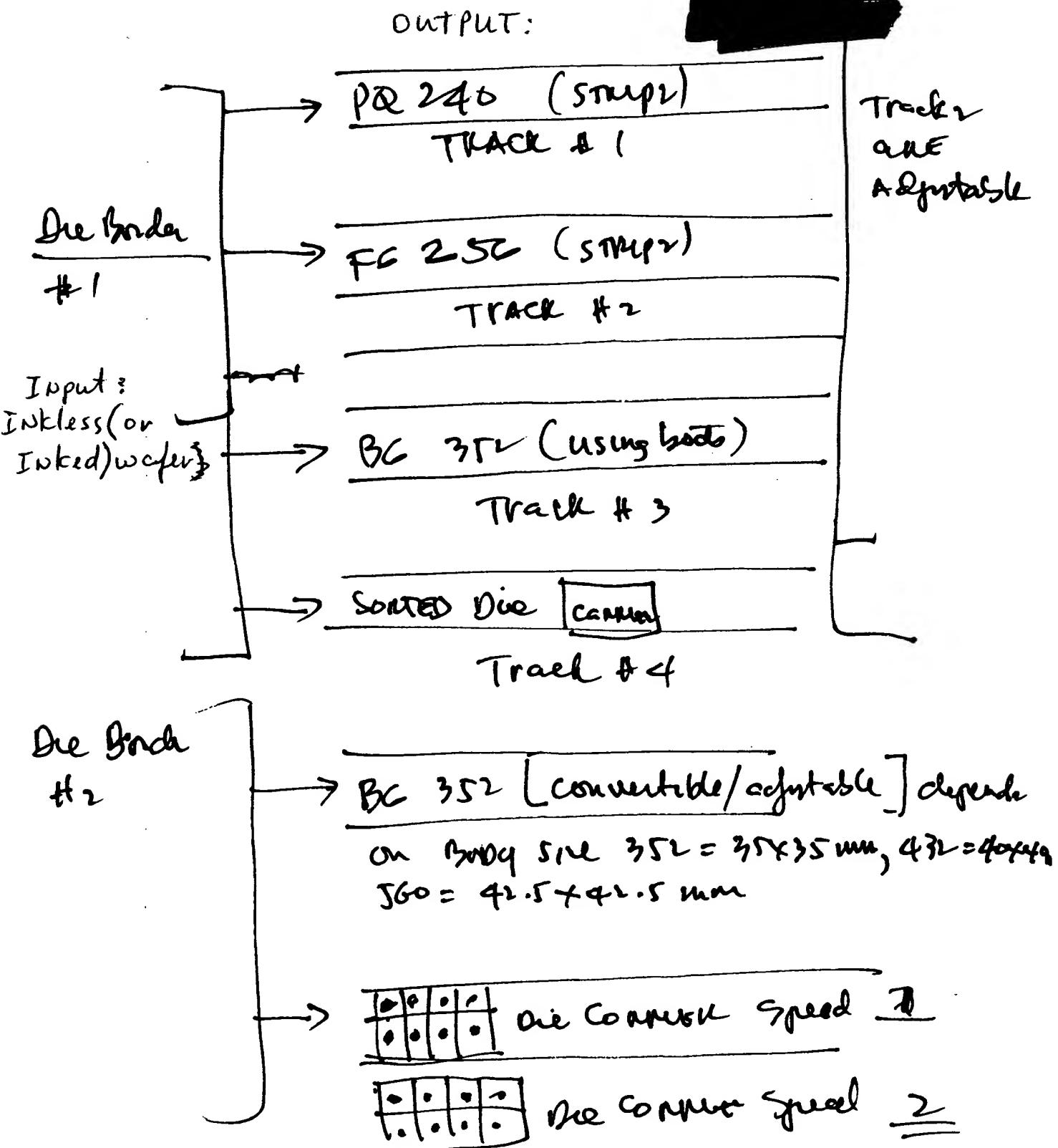
CURRENT PROCESS

○ Wafer Sort ⟨ 1. Sort good & reject die
2. Wafer Map identify speed grade
3. Inked reject die ← OR
inkless, visual

○ Saw   Dice/cut individual die

○ Die ATTACH/   1. Pick un inked die
  Bond   2. Follow wafer mapping and
pick good die and attach
on to the pre-selected single
package type.

○ WIRE BOND

○ Encapsulation/   Speed grade is not
○ MARK   marked
Pre mark to regular
mark Instructions

○ Electrical Test   SORT/Bin to
different speed

○ MARK   mark the required
speed grade

○ FG   ship required speed to
customer
Put in BIN Inventory other
units of diff. speed grades.